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RETIREMENT OF HOBART C. DICKINSON

A member of the Bureau's "old guard," Hobart C. Dickinson, chief of the Heat and Power Division, retired on October 31. Born in Bangor, Maine, and a graduate of Williams College, with a Ph. D. from Clark University, Dr. Dickinson's connection with the Bureau goes back to July 18, 1903, when he joined the staff of what was then the Heat Division, as a laboratory assistant under Dr. C. W. Waidner. He soon established a reputation for accurate work in the fields of heat measurements and the physical constants. His first paper, published in 1906, dealt with the heat treatment of high-temperature mercurial thermometers. In his early work he was associated among others with J. J. Crowe, E. F. Mueller, N. S. Osborne, and C. W. Waidner.

In 1917, on the eve of war, Dr. Dickinson was given the difficult task of designing the first altitude laboratory in the world for testing aircraft engines

under flight conditions, such a laboratory being a prerequisite to the solution of urgent problems submitted by the National Advisory Committee for Aeronautics. He not only designed, but personally supervised the building of the laboratory, and organized the Aeronautic Power Plants Section, of which he became the chief. A series of Aeronautic Power Plant Reports, issued by the NACA, was published as a result of the laboratory's pioneer work.

In 1921, Dr. Dickinson accepted the position of research manager of the Society of Automotive Engineers, but retained his Bureau connection as consulting physicist. On the death of Dr. Waidner in 1923, he returned to the Bureau as chief of the Heat and Power Division, a position that he held thenceforth till his retirement. He has been closely associated with, and personally directed, many research projects such as those on the thermodynamic properties of ammonia and steam, and particularly the cooperative fuel research, which has been carried on jointly for more than

¹ Published with approval of the Director of the Budget.

20 years by the engine builders, petroleum refiners, and the Government. No member of the Bureau's staff has excelled him in the cordial support which he has always secured from industry for Governmental research. He visited Europe four times on important scientific missions—in 1919 as acting secretary of the NACA Power Plants Committee, and in 1923 in connection with the universal adoption of the International Temperature Scale, in 1929 as a member of the International Steam Table Committee, and in 1930 as a delegate to the World Power Congress and for further conferences of the Steam Table Committee.

For many years, Dr. Dickinson has been an ardent student of the economics of our business cycle and is the author of numerous articles and a book—*Mechanics of Prosperity*—in this field. He has also devoted much thought to means for increasing the safety of highway travel, and formulated the simple "clear course ahead" rule for determining the safe speed. He served for several years as chairman of the Highway Research Board, is a past president and honorary life member of the Society of Automotive Engineers, and a life member of the American Society of Refrigerating Engineers and of the Philosophical Society of Washington (since 1904). Other professional organizations to which he belongs include the American Physical Society, Washington Academy of Sciences, American Society of Mechanical Engineers, and the American Association for the Advancement of Science. His career furnishes an excellent example of what can be accomplished by the scientist and engineer of true breadth of vision. He has been invited to remain at the Bureau as a guest worker, to resume his earlier researches on the thermal conductivity of materials at high temperatures.

Dr. Henry T. Wensel, who has been named acting chief of the Heat and Power Division, came to the Bureau in 1917, and for many years was in charge of the Pyrometry Section. He has done extensive work on the utilization of black bodies at fixed temperatures as standards of radiometry and pyrometry. During the past 4 years, as technical aide of both the Uranium (S-1) Section and of the S-1 Executive Committee of the Office of Scientific Research and Development, he has been active in administering the OSRD program of atomic research. Coincident with the taking over of this research by the Army, Dr. Wensel, as chief of the Technical Division (subsequently re-

named the Research Control Section) of the Manhattan District, became the technical advisor to the district engineer.

RAILROAD TRACK SCALE TESTING

In spite of limited appropriations and personnel, the Bureau is still rendering an important service to carriers and shippers through its continuous checking of representative railroad weighing facilities. For instance, during the month of September, track scale test car No. 1, in charge of David V. Smith, operating in the States of Washington, Oregon, California, Nevada, Utah, and Colorado, covered more than 2,300 miles and completed one or more tests on each of the following railroads: Northern Pacific; Spokane, Portland, and Seattle; Southern Pacific; Western Pacific; Union Pacific; Nevada Northern; and Denver and Rio Grande Western. During this 30-day period, 20 railroad track scales, including the very important master scales at Portland, Oregon (Public Utilities Commission of Oregon); Oakland, California (Southern Pacific System); and Salt Lake City, Utah (Union Pacific System) were tested. Although only a relatively small number of tests could be made as compared with similar periods when the equipment was operating in the more densely populated eastern States, the amount of work accomplished was very satisfactory. The equipment was able to maintain an admittedly "tight" schedule, involving long hauls and frequent interchanges between carriers.

The equipment is now operating in the Fort Worth-Dallas district where several railroad-owned test-weight cars that do not have access to any master scale are being standardized. Recently, three test-weight cars belonging to various railroads were standardized on the Bureau's master track scale at Clearing, Ill. The facilities of the scale depot were, likewise, utilized in standardizing a 6,100-pound test weight of special design belonging to a large smelting and refining company.

THEODOLITE CIRCLES

Thorough tests were made of four theodolite circles manufactured by Carl Zeiss in Germany and brought to this country by I. C. Gardner, chief of the Bureau's Optical Instruments Section. These were found to be excellent circles so far as accuracy of the graduations was concerned. The lines, however, were lacking in quality and did not have

the "nicety" of those ruled by B. L. Page of the Length Section. Nevertheless, these were the first foreign circles ever tested at the Bureau that were at all comparable in accuracy with those made here.

HOROLOGICAL INSTITUTE JOURNAL

The executive committee of the Horological Institute of America of which R. E. Gould, chief of the Time Section is secretary, met at the Bureau on September 19. The special activities fund of the Institute now amounts to \$16,000, and was deemed sufficient to start the publication of a technical periodical to be known as the Journal of the Horological Institute of America. It is hoped that the first number will appear in January 1946. The Bureau has offered desk space for the editor, in the Time Section, until a room is again available in the National Academy of Sciences building.

IMPACT STRENGTH OF ROPE

Rope used as safety lines by mountain troops must be strong enough to absorb the impact load resulting from a man falling a distance equal to twice the length of the rope. This worst condition would occur if an individual fell from a position directly above the point of attachment of the rope, with the rope fully extended.

At the request of the Office of the Quartermaster General, nylon and sisal ropes, representing fibers and sizes commonly in use, were tested in order to compare their behavior under static and impact loading. A report, presenting the data in tables and graphs and discussing the results of the tests, has been prepared by Sanford B. Newman and Helen G. Wheeler. It will appear as RP1679 in the November number of the Journal of Research.

Static tests were performed in a hydraulic testing machine; the speed of the head was adjusted to that called for in most specifications for rope. Impact tests were made by using special fixtures that permitted steel disks to fall on a pan attached to the rope.

It was found that the amount of energy absorbed by ropes, up to failure, was greater under impact loading than under static loading. The stretch at or just before failure was the same for both static and impact loading, which is in line with the conclusions of other workers who found the stretch of rope at failure to be the same in static and creep tests.

These tests indicate that it is safe to use the energy determinations derived from static tests for impact purposes if the rope lengths approximate those of the test specimens.

WEARING QUALITY OF EXPERIMENTAL CURRENCY-TYPE PAPERS

When the supply of linen fiber used to make currency paper was threatened by the war, the Treasury Department requested an investigation of substitutes and of means for improving the quality of the paper. A considerable number of experimental papers were made of fibers such as linen, cotton, carao, sisal, and several types of wood. Portions of the papers were surface-sized with glue, which was tanned or hardened with alum or formaldehyde. Some of the papers contained melamine resin, which was added to improve the resistance of the surface to abrasion and to increase the strength when wet.

In addition to the usual tests, a crumpling test was developed to simulate the wear of currency in service. The strength, toughness, and wearing quality of these experimental papers indicate that the most promising substitutions or additions, yielding papers comparable to that now used for currency, would be the use of more cotton fiber, the use of some carao fiber, and the addition of melamine resin. A complete report of the findings has been given to the Treasury Department and has been approved for publication.

WAR-TIME DEVELOPMENTS IN THE GERMAN TEXTILE INDUSTRY

The Bureau has agreed to assume responsibility for the operations of the textiles subcommittee of the Technical Industrial Intelligence Committee, which was disestablished on September 30. The Bureau will serve as an advisor to the Technical Industrial Branch of the Joint Intelligence Objectives Agency as regards proper completion of the investigation of wartime developments in the German textile industry. About 40 textile technologists are at present employed in this work. The Bureau will be the recipient of the reports prepared by the investigators and the very large amount of material collected by them, and will assume the primary responsibility for the review of such reports and for the analysis and study of the material. The substance of all the information obtained will be made available to the American textile

industry through the newly established Office of Information of the Department of Commerce.

ALKALINE WRITING INKS

Iron gallotannate inks for making permanent records contain high amounts of iron, usually 4 to 7 grams per liter. The formation of sediment is inhibited by acid, frequently mineral acid, which is known to have a deleterious effect on the cellulose of paper. The advantages of a solution, slightly alkaline, of diammonium hydroxyferrigallate for record purposes are discussed in J. Research NSB 14, 464 (1935). This solution does not appear to be offered by manufacturers. Methods of preparing it and one containing disodium hydroxyferrigallate are presented in an article that W. H. Smith and N. P. Hanna of the Bureau's Chemistry Division have prepared for publication in American Ink-maker.

PAINT MANUAL, WITH PARTICULAR REFERENCE TO FEDERAL SPECIFICATIONS

Building Materials and Structures Report BMS105, which has just been released, is a manual of recommended painting practice compiled as a guide for interested Federal agencies; it is the successor to Technologic Paper T274 issued in 1924 and long out of print. Percy H. Walker and Eugene F. Hickson, who prepared both papers, direct special attention to the properties of paint and paint materials purchased under Federal Specifications, and suggest procedures for the preparation of surfaces prior to painting, the mixing, sampling, and inspection of the paint, and precautions in its use. The publication contains formulas that will be helpful in using job-mixed paints.

Copies of BMS105 (bound in buckram) are obtainable at \$1.00 each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

WATERPROOFINGS FOR CONCRETE AND MASONRY

About 35 years ago the Bureau published a paper (Technologic Paper T3) describing an investigation of waterproofing materials and methods for concrete and masonry. The keen interest in the subject shown then by builders and home owners has not abated. Many requests for information are being received, and agencies of the Government continue to seek the Bureau's aid in the

solution of problems in this field. During the past 4 years, these agencies have submitted many samples of waterproofing materials for examination and appraisal. Although it has not been possible to conduct a systematic and thorough investigation, such as might develop or disclose materials and methods much better than those in common use, results of the routine tests conducted to date have shown little that is basically new and no waterproofing materials that are markedly superior to those described in the Bureau's first report.

WATER-RETAINING POWER OF MASON'S HYDRATED LIME

Hydrated lime is often added to portland cement mortars to improve their plasticity and water-retaining power. It is known that limes differ in their effectiveness in this respect, and the specific information needed as a guide in preparing specifications is now being developed. The water retentivity of 46 hydrated limes, representing a fair cross section of the different types produced, has been determined. Twelve hydrated limes of the high calcium group showed the greatest variation in water retentivities of all the groups, with values ranging from 74 to 96 percent. With one exception, 17 regular dolomitic hydrated limes gave values ranging from 82 to 91 percent. Six pressure hydrated and six partially pressure hydrated limes gave values between 90 and 96 percent. Three magnesium and two silo-hydrated limes had retentivities between 89 and 96 percent. Using the same technique and apparatus, two different operators, with reasonable care, could check to within about 3 percent.

STRUCTURAL PROPERTIES OF PREFABRICATED PLYWOOD

Seventy-five specimens of prefabricated plywood building panels of both lightweight stress-skin and commercial design submitted by the Douglas Fir Plywood Association were tested at the Bureau, and the results are given in Building Materials and Structures Report BMS104. Wall, partition, floor, and roof constructions were of lightweight stress-skin design. Specimens of commercial-type panels were for wall construction only and furnished a basis of comparison of strength and weight with the lightweight constructions. Tests were conducted in accordance with the procedures described in Building Materials and Structures Report BMS2. Copies of the new report are obtainable

from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is 25 cents.

COMMERCIAL STANDARD FOR DOUGLAS FIR STOCK DOORS

Printed copies of the latest Commercial Standard for old growth Douglas fir standard stock doors are now available. This revision, designated CS73-45, covers four grades and includes layouts for house, garage, and cupboard doors and sidelights. It includes illustrations for 77 different standard stock designs from which selections can be made that will harmonize with various architectural treatments. By referring to this standard and specifying the design number, the architect or purchaser can obtain doors to meet his need with ample competition, prompt delivery, and at a considerable saving in cost as compared with custom-made doors of like quality and construction.

The booklet includes a brief history of the project, a list of official acceptors, and the membership of the standing committee, the chief function of which will be to consider revisions of the standard to keep it abreast of progress in the industry.

Printed copies of CS73-45 are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. at 10 cents each.

COMMERCIAL STANDARD FOR DRINKING-WATER COOLERS

The Bureau has just released Commercial Standard CS127-45, Contained Mechanically Refrigerated Drinking-Water Coolers, which provides definitions, general requirements, methods of testing and rating, standard rating conditions, recommended normal standard sizes, and minimum capacities, as well as uniform guarantees of ratings of these devices.

The standard applies to all sizes of drinking-water coolers, whether of the insulated storage or instantaneous types, and whether air-cooled or water-cooled. It includes a list of the elements to be furnished as minimum standard equipment, and provides for the publication of nine items of standard capacity ratings, as well as application ratings for (1) capacity, gallons per hour; (2) storage capacity; (3) ambient temperature; (4) drinking-water temperatures, incoming and outgoing; (5) refrigerant used; (6) electric current used, including kind, voltage, frequency, and phases; (7) power input and/or performance factor; (8) condenser-water tempera-

tures, incoming and outgoing; and (9) condenser-water consumption of water-cooled condensers.

The standard should provide not only a basis for much better understanding between buyers and sellers as to the significance of standard ratings and application ratings, but should also insure fair competition without in any way hampering individual differences of design or construction, or improvements to be developed in the future.

Printed copies of the standard are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 10 cents each.

JAR RINGS FOR USE IN HOME CANNING

The purpose of an investigation of jar rings for home canning described in Miscellaneous Publication M181, which has just been released, was to correlate certain properties of the rings with canning tests conducted at the Bureau of Home Economics, United States Department of Agriculture.

Fifty-four samples of jar rings obtained from 11 manufacturers were analyzed for rubber content, and measurements were made of tensile strength, ultimate elongation, stress at 100 percent elongation, swelling on processing, indentation by apparatus designed to simulate a jar cap, and hardness. Only the swelling, indentation, and hardness tests made before and after processing bore a relation to the canning failures. The relation was not exact because some failures undoubtedly resulted from excessive variations in the jars and tops. Apparatus was developed for accurately measuring profiles of sealing surfaces. Results of the investigation are expressed in terms of a proposed specification for jar rings. Copies of M181 are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is 10 cents.

DETERMINING SMALL AMOUNTS OF GOLD

Many articles of jewelry, such as watch cases, rings, lockets, earrings, tie clasps, ornamental and emblematic buttons, coverings for knife handles, brushes, combs, and insignia for the armed forces, are electroplated with gold, the thickness of which may vary from less than one-millionth to more than one ten-thousandth of an inch.

To determine the thickness of these thin films of gold, for conformity to Commercial Standards, a method has

been developed whereby an area of one square millimeter (0.00155 square inch) can be cut out by a special punch and die. After removal of the underlying base metal with nitric acid, the minute amount of gold is dissolved in aqua regia, the solution evaporated to dryness, and the dry residue treated with *o*-tolidine to produce a yellow color, which is measured spectrophotometrically. With an experimentally established curve, the quantity of gold in terms of percentage transmittance of light can be directly translated into thickness of gold layer. The method is so accurate that it is even possible to determine variations in the thickness of the gold layer.

PURITY OF HYDROCARBONS

In the November number of the Journal of Research appears a report (RP1676) on the determination of the purity of hydrocarbons by measurement of freezing points by Augustus R. Glasgow, Jr., Anton J. Streiff, and Frederick D. Rossini of the Section of Thermochemistry and Hydrocarbons. This report, which was prepared in collaboration with the American Petroleum Institute Research Project 6 on the "Analysis, Purification, and Properties of Hydrocarbons," covers the following topics: Principles involved; apparatus and materials required; experimental procedure for a freezing experiment and for a melting experiment; evaluation of the freezing point from a freezing curve and from a melting curve; calculation of the purity when the freezing point for zero impurity is known; evaluation of the freezing point for zero impurity; and determination of the cryoscopic constant.

SECOND DISSOCIATION CONSTANT OF *o*-PHTHALIC ACID

The measurement and control of acidity or alkalinity (pH) is important in industrial processes that involve solutions. One of the most useful standards for the determination and control of pH in the region of 5 to 6 is a mixture of acid potassium phthalate and dipotassium phthalate. RP1678 in the November Journal of Research reports measurements by W. J. Hamer and S. F. Acree of the electromotive forces of galvanic cells comprised of hydrogen and silver-silver-chloride electrodes with 72 different solutions containing mixtures of acid potassium phthalate, dipotassium phthalate, and potassium chloride, at 13 temperatures from 0° to 60° C. Pure materials, including NBS

Standard Sample 84a or 84b of acid potassium phthalate were employed. From electromotive force data, the second dissociation constant of *o*-phthalic acid and related thermodynamic quantities were evaluated, and pH values were assigned to 217 solutions, including certain ones that contained no potassium chloride. The evaluation of the pH of these last entails the measurement of the electromotive force of solutions containing the same amount of the phthalate salts and different amounts of potassium chloride and an extrapolation to zero salt concentration. Mainly because of an increase in the ionic strength, the addition of potassium chloride lowers the pH of the solutions, the decrease in pH being greater for dilute than for concentrated solutions of phthalates.

The pH values of the solutions range from 4.868 to 5.720 and are known with a precision of 0.003 pH unit. They vary only slightly with changes in temperature, exhibit a minimum value at 18° C, and are only 0.1 pH unit higher at 60° C than at 0° C. Their usefulness as pH standards is therefore enhanced by their low temperature coefficient. The values are higher by approximately 0.04 pH unit than ones previously assigned to solutions of the same composition. This may be explained by the use of hydrogen-ion activity rather than hydrogen ion concentration as the basis of the pH scale, and by the elimination of liquid junction errors. Directions are given for the preparation of the solutions and for their use in the calibration of pH equipment.

pH OF STANDARD BUFFER SOLUTIONS AND THE CALIBRATION OF pH METERS

In an article prepared by G. G. Manov and S. F. Acree for publication in the Bulletin of the American Society for Testing Materials, an outline is given of the methods used at the Bureau for determining the ionization constant of various organic and inorganic acids, the pH of buffer solutions, and for standardizing the pH scale. The sources of error, the precision, and the accuracy of the standard pH values, the methods for estimating the correction to the liquid-junction potential, and the calibration of pH meters are discussed.

OXIDATION OF GALACTURONIC ACID

Work at the Bureau several years ago revealed that galacturonates in alkaline solution are readily oxidized by oxygen

and that salts of *D-arabo*-trihydroxyglutaric acid can be separated from the reaction mixture. It was also known that tartrates can be obtained from 5-keto-gluconic acid by a similar process. As methods have been developed for the preparation of galacturonic acid from pectic substances and for the preparation of 5-keto-gluconic acid by mold fermentation, galacturonic acid and 5-keto-gluconic acid are potential raw materials for the production of other substances.

In the *Journal of Research* for November (RP1680), Horace S. Isbell and Nancy B. Holt report quantitative measurements of the amounts of tartaric acid and of trihydroxyglutaric acid formed by the oxidation of galacturonic acid and 5-keto-gluconic acid with oxygen in alkaline solution. The oxidation of sodium galacturonate with oxygen in alkaline solution gives sodium oxalate, *levo*-rotatory sodium tartrate, and sodium *D-arabo*-trihydroxyglutarate in yields of 0.10, 0.10, and 0.45 mole, respectively, per mole of sodium galacturonate. The oxidation of sodium 5-keto-gluconate under like conditions gives sodium oxalate, dextrorotatory sodium tartrate, and sodium *xyl*o-trihydroxyglutarate in yields of 0.29, 0.10, and 0.45 mole, respectively, per mole of sodium 5-keto-gluconate. Directions are included for the preparation of potassium *D-arabo*-trihydroxyglutarate from sodium galacturonate. The method is simple and suitable for the preparation of small quantities of the salt for investigational purposes, but as the yield is only 45 percent of the theoretical, the method is not suitable for preparing the salt in large quantities.

NEW AND REVISED PUBLICATIONS ISSUED DURING OCTOBER 1945

*Journal of Research*²

Journal of Research of the National Bureau of Standards, title page, corrections, and contents to volume 34 (RP1624 to RP1659, inclusive). Price 5 cents.

Research Papers²

[Reprints from July and August 1945
Journal of Research]

RP1660. Single-cylinder engine tests of substitute motor fuels. Donald B. Brooks. Price 10 cents.

RP1661. Thermodynamic properties of 1,3-butadiene in the solid, liquid, and vapor states. Russell B. Scott, Cyril H. Meyers, Robert D. Rands, Jr., Ferdinand G. Brickwedde, and Norman Bekkedahl. Price 10 cents.

RP1662. Effects of some oxide additions on the thermal length changes of zirconia. R. F. Geller and Paul J. Yavorsky. Price 10 cents.

RP1663. Acetyl derivatives of certain heptoses, of gulose, and of lactulose. Harriet L. Frush and Horace S. Isbell. Price 5 cents.

RP1664. Mass spectrometric analyses of hydrocarbon and gas mixtures. A. Keith Brewer and Vernon H. Dibeler. Price 10 cents.

RP1665. Heats of combustion and isomerization of the eight C_8H_{18} alkylbenzenes. Walter H. Johnson, Edward J. Prosen, and Frederick D. Rossini. Price 5 cents.

RP1666. Thin-walled aluminum beta-ray tube counters. Burrell W. Brown and L. F. Curtiss. Price 5 cents.

RP1667. Method of Lagrangian curvilinear interpolation. William J. Taylor. Price 5 cents.

Simplified Practice Recommendations²

R211-45. Clay sewer pipe and fittings. Price 10 cents.

Miscellaneous Publications²

M178. National Directory of Commodity Specifications. (Supersedes M130.) Price \$4.00.

M181. Jar rings for use in home canning: Their testing and a proposed specification. Price 10 cents.

Technical News Bulletin²

Technical News Bulletin 342, October 1945. Price 5 cents. Annual subscription, 50 cents.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having a definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC802. Plastics: A short list of selected publications. (Supersedes LC782.)

LC803. List of commercial standards. (Supersedes LC793.)

LC804. List of published material relating to building regulation. (Supersedes LC716.)

² Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Subscription to Technical News Bulletin, 50 cents per year; *Journal of Research*, \$3.50 per year (to addresses in the United States and its possessions and to countries extending the franking privilege); other countries, 70 cents and \$4.50, respectively.

**RECENT ARTICLES BY MEMBERS
OF THE BUREAU'S STAFF PUBLISHED
IN OUTSIDE JOURNALS***

Recent progress in the mitigation of underground corrosion. Kirk H. Logan. Oil & Gas Journal (Tulsa, Okla.) 43, No. 36, 78 (January 13, 1945).

Brazil's research for increased rubber production. Norman Bekkedahl. Scientific Monthly (c/o Smithsonian Institution, Washington 25, D. C.) 61, No. 3, 199 (September 1945).

*These publications are not obtainable from the Government, unless otherwise stated. Requests should be sent direct to the publishers.

Variation in the quality ratio for tests of sole leather in service. Robert B. Hobbs. J. Am. Leather Chemists Assn. (Ridgway, Pa.) 40, No. 9, 348 (September 1945).

Effect of heat on portland cements containing Vinsol resin. L. Bean and A. Litvin. Bul. Am. Soc. for Testing Materials (200 South Broad St., Philadelphia 2, Pa.) (August 1945).

How strong is a "safe" building? George N. Thompson. Industrial Standardization (70 E. 45th St., New York, N. Y.) 16, No. 8, 173 (August 1945).

National Directory of Commodity Specifications. Paul A. Cooley. Domestic Commerce (Dept. of Commerce, Washington 25, D. C.) 33, No. 10, 23 (October 1945).

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